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ABSTRACT

As part of the Stanford Curriculum Study, information is provided on sex differences in undergraduate students' characteristics and performance. Attention is directed to the effect of gender on major choice, classroom performance, awards earned at graduation, and related variables for graduates from 1975-1976 to 1981-1982. A comparison to national trends is also made. The findings indicate that there is considerable conformity to sex stereotypes among Stanford students in the majors they select and their classroom performance. Women come to Stanford with lower mathematics ability than men and are strongly influenced by their established abilities in their choice of major. Women tend to concentrate in the humanistic and social science areas while men favor engineering, the natural sciences, and several traditionally-male disciplines in other areas. On the whole, women at Stanford are similar to women in the nation in their degree of conformity to traditional sex differentiation. In addition, women perform less well in natural science and engineering courses; however, poorer performance by women in technical courses is limited mostly to introductory courses. The proportion of women in engineering and the earth sciences increased rapidly in the late 1970s. (SW)

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SEX DIFFERENCES IN STUDENT CHARACTERISTICS AND PERFORMANCE
Third in a Series About the Stanford Curriculum Study

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SEX DIFFERENCES IN STUDENT CHARACTERISTICS AND PERFORMANCE

ABSTRACT

An important aspect of the Stanford Curriculum Study is the monitoring of sex differences in the undergraduate population. This article examines the effect of gender on major choice, classroom performance, awards earned at graduation, and related variables for graduates from 1975-76 to 1981-82. Policy implications of the results are discussed.

SEX DIFFERENCES IN STUDENT CHARACTERISTICS AND PERFORMANCE

Third in a Series About the Stanford Curriculum Study

Our first two articles in this series dealt with (1) the history and methodology of the Stanford Curriculum Study and (2) the distributions of degrees granted and course enrollments across academic departments [2, 3]. To recapitulate briefly, the Curriculum Study examines the background characteristics and academic records of all bachelor's degree recipients each year, providing the university with a statistical record that can be used to monitor the behavior of undergraduates on a longitudinal basis. The information produced by the project is used to inform undergraduate policy-making bodies in the university. This series of articles is intended to illustrate the kinds of research that curricular analysis makes possible and to demonstrate the usefulness of this type of analysis.

In the present article we examine a number of issues concerning differences between men and women undergraduates at Stanford University. We show how the Curriculum Study can be used to monitor progress at the university in removing barriers to equal participation by both sexes in all academic areas, particularly in areas such as the natural sciences and engineering where women have been few in number. The questions we address in this chapter include:

--To what extent is the distribution of men and women across major fields of study in conformity with traditional sex stereotypes? For example, do men favor technical disciplines while women favor humanistic areas?

--Are there any notable trends in the distribution of the sexes across majors? For example, are women more likely to major in engineering now than formerly? How can such trends be explained?

--How are students' abilities related to sex differences in choice of major?

--Are there significant differences in the classroom performance of women and men in different academic areas? How are these differences related to choice of major?

--Are there significant differences between men and women in earning awards at graduation or, conversly, having academic difficulty?

METHODOLOGICAL CONSIDERATIONS

Most of the data we present in this article is organized in terms of the "school division." A school division is a group of academic departments having a shared disciplinary emphasis. The six school divisions used here include the School of Earth Sciences, the School of Engineering, and four divisions within the School of Humanities and Sciences: the humanities, natural sciences, social sciences, and interdepartmental programs. We also use data from individual departments in order to show the kinds of concerns that should be addressed at a finer level of analysis.

As in our previous article on degrees granted, we frame the findings for sex differences at Stanford within a larger context by using national data for comparison purposes. The larger context is essential if we are to understand the findings at the local level. For example, if the percentage of women receiving degrees in English literature is falling at the national level but rising at Stanford, it is likely that conditions peculiar to Stanford account for the local change. If local change is parallel to national change, however, it is more likely that the impetus to change is located outside Stanford. In the former case the university is likely to be able to influence the trends among students to a considerable degree. In the latter case the wiser policy is often to adapt to the trends instead.

CHOICE OF MAJOR FIELD OF STUDY

A. Trends at Stanford from 1975-76 to 1981-82

The Curriculum Study has produced statistical reports covering seven years, 1975-76 to 1981-82. Over this period about 41% of all graduates were women; this figure varied only slightly from year to year. But the percentage of women in each of the school divisions varied greatly, as shown in Table 1. The mean figures show that women made up 56% of the majors in interdepartmental programs, far more than their share of all students. They were overrepresented among humanities majors as well (53%). On the other hand, they were somewhat underrepresented among earth science and natural science majors and very severely underrepresented among engineering majors, constituting only 18% of the latter. In general these figures reveal considerable conformity to traditional sex-role expectations: women tended to avoid technical and "hard science" areas, favoring the humanities and interdepartmental programs instead [cf. 1, 4, 7].

But there were important changes in the distribution of the sexes across school divisions which suggest less adherence to sex stereotypes as time went on. While the figures were largely stable for most of the school divisions, the proportion of women in engineering and the earth sciences increased sharply over the seven years. The proportion of women in interdepartmental programs increased moderately.

For a fuller understanding of the situation we must look at the data at the departmental level. The mean figures for departments are given in Figure 1. We have omitted very small departments that awarded less than ten degrees per year.

Among the humanities departments, at the top of the figure, we find a good deal of conformity to sex-based expectations. Women were heavily

overrepresented in the languages, the arts, and English. These are traditionally "female" college majors. But women were considerably underrepresented in classics and philosophy, two traditionally "male" areas. They were evenly represented in history, a generally male domain, but this was the only case in which the sex stereotypes did not hold. There were no clear trends for any of these departments (year-by-year figures are not shown).

In the social sciences more evidence of sex-stereotyping is apparent: women were underrepresented in economics and political science, two "male" domains, while they were overrepresented in the other four areas, three of which (all but communication) have long been comprised largely of women. By contrast, in the natural sciences women were seriously underrepresented in most departments (physics, chemistry, and mathematics) but only slightly underrepresented in biology. Since we know that the majority of biology majors intend to go to medical school, we can conclude that this is an area in which women were successfully challenging traditional barriers. In the other fields, though, conformity to sex stereotypes was quite strong. Again, none of the social or natural science departments was characterized by trends in the figures.

The interdepartmental programs are quite disparate in nature and have highly variable proportions of women. Women were heavily overrepresented among human biology and American studies majors. They were underrepresented in mathematical sciences, as might be expected, but moderately overrepresented in international relations, which is somewhat surprising. Human biology, international relations, and American Studies are complicated cases because each contains quite varied areas of concentration, and unfortunately we do not have data on the sex composition of the areas of concentration. But we know that human biology draws a high percentage of women because its natural

science concentration is an attractive pre-medical major for women who want to avoid taking mostly natural science courses (as a biology major must). To some degree this same type of argument explains the modest overrepresentation of women among international relations majors--the program is viewed as less technical and confining than either economics or political science. Further, its international focus and foreign language requirement tend to coincide more with the interests of women, who are more likely both to study languages and to attend a Stanford overseas campus. American studies as a whole is composed largely of humanities courses and thus corresponds to traditionally "female" interests, a fact which helps account for the very great increase in the proportion of women in the program since its inception in 1976-77.[1]

The engineering departments had uniformly very weak representation of women among their graduates, with the lowest means in the two areas considered technically most demanding, electrical and mechanical engineering. To balance this picture, it is important to note that the proportion of electrical engineering majors who were women grew considerably over the period (from 7% to as high as 18% in 1979-80). The same was true of industrial engineering (from 5% to as high as 33%, at a time when the total number of graduates in the department was itself rising rapidly).

The earth sciences present a very strong contrast to engineering. Women were actually overrepresented in applied earth sciences, and they were only moderately underrepresented in the school's other large department, geology. Furthermore, the proportion of women in the school as a whole increased to the point that women were slightly overrepresented among its graduates by 1981-82.

In general, then, we find that variations within school divisions were largely consistent with sex-based norms about the choice of a major. Women tended to be overrepresented in the humanities and in other less technical

departments and programs, especially for the social sciences, but they were underrepresented in the more technical areas and in the humanistic areas that have historically been largely male domains (philosophy and classics). There were, nonetheless, some departments where sex stereotypes were not operating. Chief among these were the earth science departments, biology, and, with some reservations, the interdepartmental programs of human biology and international relations.

Of perhaps greater importance than the current proportions of women in the various departments are the trends away from sex stereotyping in engineering and the earth sciences. The strongest increases in the percentage of women graduates in engineering lay in electrical and industrial engineering, both of which were very popular majors. In the latter case the rise can be explained by the fact that industrial engineering became a de facto business major at Stanford in the late 1970s, a time when many women became interested in business careers (there is no undergraduate business major available at Stanford). The increase in electrical engineering was more unexpected, however, as this major is widely perceived as among the most rigorous of the engineering disciplines. This is a case where women at Stanford clearly have begun to combat successfully some of the traditional sex-stereotyped behavior patterns that operate among students.

In the earth sciences there was also a strong trend toward women graduates, to the point that by 1981-82 women were very slightly overrepresented. The attractiveness of earth sciences for women appears to be due to the small size of the school division (fewer than 50 graduates per year) and the excellent teaching reputation of many of the instructors in these departments. The earth sciences have also expended much energy in recruiting and encouraging women to enter the school.

For most other departments there were no regular and significant trends in evidence. The only exception was American studies, which we have already discussed.

B. Comparisons with the National Data

The data compiled by the National Center for Education Statistics [6] allow us to compare developments at Stanford with the national picture. These data are the subject of Figure 2, where we show the percentage of women among majors in the disciplines or groups of disciplines for which reasonable comparisons can be made. For the national data, which are available only to 1979-80, we give the figures for 1975-76 (solid portion) and for 1979-80 (striped portion). We give only the mean figures for Stanford departments because they varied quite considerably from year to year.

Two methodological notes are in order before we discuss Figure 2. Nationally, women earned a mean of 47.3% of all bachelor's degrees over the years 1975-76 to 1979-80 (dashed vertical line). These figures are slightly greater than the 41% of Stanford degrees awarded to women. We have therefore adjusted the Stanford figures upward to compensate for the lower proportion of women receiving degrees at Stanford.

Adjustments are also necessary when considering trends over the five years. At the national level women represented a rising proportion of all degrees (from 45.6% to 49.2%, an increase of about 8%, over the five years) and would therefore have increased as a proportion of degree recipients in all individual disciplines if the distribution of women across disciplines were constant over time. Hence, any increases of about six to ten percent in the proportion of women were only consistent with the general rise in women among bachelor's degree recipients. Declines in the percentage of women, or increases larger than ten percent, represent important trends meriting special

attention. At Stanford, on the other hand, the proportion of degrees earned by women did not change appreciably over the five years. Any trends in the data can thus be taken at face value.

What does the figure show about women's share of degrees in the various disciplines? In humanities areas we find that the percentage of women at Stanford fairly faithfully matched the national figures. Women received a larger proportion of arts and history degrees at Stanford, but their proportions of degrees in other disciplines were very close to the national averages.

In the social sciences, Stanford women earned significantly higher proportions of degrees than the national averages in anthropology, communication, and sociology. With the exception of communication, these are disciplines where women in the USA as a whole were overrepresented--pointing to over-conformity to sex-stereotyped interests among Stanford women. For the two most clearly "male" disciplines, economics and political science, women at Stanford were about as well represented as women in the nation. But the proportions of women earning degrees in the latter two fields was clearly increasing rapidly at the national level, while at Stanford there was no corresponding rising trend.

In the larger departments of the natural sciences, biology and chemistry, the match between the adjusted Stanford figures and the national averages was quite close. There were sizable deviations for mathematics/statistics and physics, but these departments had so few majors at Stanford that the differences cannot be considered reliable. Overall it appears that women at Stanford were about typical of the nation in the degree to which they entered the natural sciences, although we should remember that many women at Stanford pursued a less technical natural science major in the human biology program.

For interdepartmental programs we have only two comparisons to make. Stanford women were about typical in their pursuit of American studies degrees while they were rather significantly overrepresented in international relations. The latter represents a case like communication in which balanced sex representation at the national level contrasted with imbalance at Stanford.

To this point it appears that Stanford women were quite similar to other college women in their choice of major, although there were a few cases where they either overconformed to sex stereotyping or acted in conflict with it. In engineering and the earth sciences, by contrast, women were more highly represented among degree recipients at Stanford than in the USA as a whole in virtually every department. Some of the contrasts are very striking: in civil and mechanical engineering, for example, the proportions of women at Stanford were more than three times the mean national figures. It is evident that the share of engineering degrees taken by women was rising rapidly at the national level as well as at Stanford, but Stanford women seemed to be well ahead of women in the nation.

Finally, as we have seen before, in the earth sciences women at Stanford earned degrees about in proportion to their share of all degrees, and with respect to the national norms they earned far higher proportions in both earth science disciplines for which comparisons can be made. Here the contrast is even more striking because there was little growth in the share of earth science degrees earned by women in the nation.

In sum, the main differences between Stanford students and the national population in the sex composition of disciplines lay in the engineering areas, although at the national level women in engineering increased rapidly in recent years as well. This is an important finding for the university. It

indicates that the efforts made at Stanford in the latter half of the 1970s to lower the barriers to the entry of women into technical professions have been fairly successful. While there is a national trend in the same direction, the fact that Stanford women are much more likely than women in the nation to enter engineering assures the university that it is not simply "riding the wave" of national change but is on the forefront of change. At the same time, this finding suggests that the university cannot complacently relax its efforts in the belief that further effort is unnecessary because so much has already been achieved. Rather, the fact that lower proportions of women enter engineering at the national level implies that a relaxation of effort at Stanford might well lead to a decline in women engineers.

The low proportions of women in scientific disciplines at Stanford is less welcome, of course, as is the fact that women and men tend in general to follow traditional expectations about "female" and "male" majors in so many other areas. These findings suggest that the heavy emphasis on encouraging women in engineering may have led to the neglect of sex differentiation in other areas, not only in the natural sciences but also in predominantly female areas such as the social sciences and humanities. While considerable progress has been made in lowering barriers to women in engineering, little concern has been shown with regard to barriers to men in humanistic and some social science areas.

ESTABLISHED ABILITIES AND CHOICE OF MAJOR

In this section we examine the relationship between students' established abilities as measured by Scholastic Aptitude Test scores and their choice of major. It is reasonable to believe that the variations in the percentage of women receiving degrees in different departments is due at least in part to the differential abilities of students. Our interest here lies in determining

how strong the effect of established ability on choice of major is, and whether there are any significant differences between women and men in the nature of this effect.

In analyses not presented here, we found that there were systematic differences among groups of majors at Stanford in verbal and mathematics scores, with the differences generally being in line with common expectations about the respective abilities of students in the various major schools. For example, students with higher verbal scores tended to major in the humanities while students with higher mathematics scores tended to major in engineering. Do we find the same sorts of self-selection differences with respect to men and women students? The data to answer this question are presented in Table 2. Only one year's results (1979-80) are presented, but results for other years were very similar.

Table 2 uses dichotomous SAT variables, with each sex split at its own median score to yield "high" and "low" groups.[2] The verbal score is cross-tabulated against the mathematics score to produce four categories of students. The categories include students having high verbal and mathematics scores, students having low verbal and mathematics scores, and students having mixed scores (high on one scale and low on the other). The figures given in the table are index numbers that measure the differential propensity of students from a given group and sex to major in each school division.[3] The index number equals 100 when the tendency to choose a given school division is the same for students of a given sex in a given group as for all students of that sex. For example, if 7.2% of all women majored in engineering and 7.2% of the women in the group having high verbal and high mathematics scores majored in engineering, the index number for women in the "high-high" group would be 100. The higher the proportion of women in the high-high group

relative to the proportion of all women majoring in engineering, the higher the index number; if 14.4% of the high-high women chose engineering in this example, the index number would be 200.

Let us begin with the top two rows of the table. Women who had both high verbal and high mathematics SAT scores were especially likely to major in engineering and the natural sciences (index numbers of 141 and 142, respectively) and least likely to major in interdepartmental programs. More generally, women in the high-high group tended more toward technical disciplines than non-technical ones. The same was true of men but to a lesser extent. Men in this group were about 45% overrepresented in the natural sciences (index number of 145) but only slightly overrepresented in engineering, so that the mean deviation from 100 for men (20.0) was somewhat lower than that for women (25.2).

For the group of students below the median on both SAT scales (the second pair of rows) we find the converse effect. Both women and men in this group were especially likely to <u>avoid</u> the technical disciplines and to prefer the humanities and social sciences instead. For this group, however, the two sexes were about equally underrepresented in the natural sciences and engineering and proportionately represented or overrepresented elsewhere to about the same extent; the mean deviations from 100 for the five groups were 21.8 for women and 23.4 for men.

For the two extreme groups of students, then, there was a fairly strong self-selection process at work such that students with stronger established abilities (high SAT scores) gravitated more toward technical disciplines and students with weaker abilities gravitated toward humanistic and social science disciplines. For the high-high group, women were more affected than men by these ability measures.

Let us next turn to the figures for the mixed groups. We expect students of high verbal ability and low mathematics ability to avoid technical disciplines while students of high mathematics ability and low verbal ability prefer the technical disciplines. This is indeed the case. For the high verbal/low mathematics group, women avoided engineering and the natural sciences almost completely; the index numbers for these areas are strikingly low. Men in this group also avoided technical areas but to a much lesser extent. For the low verbal/high mathematics group, on the other hand, women were very strongly inclined toward the technical areas and away from the humanities and social sciences. Again, men showed these same tendencies but in a more attenuated form except with respect to interdepartmental majors. For both these groups, the mean deviations for men were well below those for women.

A final revealing comparison is that between students high in verbal and low in mathematics ability and students low on both scales. We expect the former group to prefer the humanities and social sciences but there is no a priori reason for students in one of these groups to avoid technical disciplines more studiously than students in the other group. For men the results are as expected: men having low mathematics scores were clearly overrepresented in the humanities and social sciences (index numbers ranging from 100 to 150) and underrepresented in technical areas (about 60 to 80), and to about the same extent within each group. But for women there was a much stronger tendency in the high verbal-low mathematics group to avoid technical areas than among the low-low students. In other words, women were much more heavily influenced than men by their high school preparation to select majors "suited" to their established abilities. The same type of exaggerated effect of measured abilities on major choice is evident in the comparison of the high-high group and the low verbal-high mathematics group.[4]

The overall conclusion suggested by Table 2 is that women were more sensitive than men to established measures of their abilities. Without high mathematics ability they were much less likely than men to enter technical disciplines; with high mathematics ability but low verbal ability they avoided non-technical disciplines more than men. Hence women's choice of major appears to have been affected more by the expectations set up by formal measures of educational preparation and ability; they behave less freely than men with respect to these formal measures in making their major choices.

Why might this be the case? What can the university do in response to this finding? It seems likely that the heightened sensitivity of women to these formal ability measures has been created by the university itself to some extent. Efforts to encourage women to enter the natural sciences and engineering often stress the idea that women who have good mathematical ability should "give it a try," but women who have not demonstrated strong mathematics ability are implicitly discouraged from exploring majors in these areas. Because special efforts of this sort are not carried out with respect to men, women are being influenced more than men by their beliefs about their abilities (which are in turn closely related to their SAT scores). The university is thus trapped between the desire to encourage qualified women to enter hitherto "male" domains and the desire to encourage students not to feel bound by their past achievements or shortcomings in exploring possible majors in college. Policy decisions in this area therefore must balance these conflicting desiderata.

CLASSROOM PERFORMANCE BY WOMEN AND MEN

Another factor that is important both in its own right and as a determinant of choice of major is classroom performance. We might expect men at Stanford to perform better in areas requiring strong mathematical ability

because they have higher demonstrated mathematical ability (i.e., SAT scores). But most students at Stanford have very strong abilities in all academic areas, and their strong backgrounds equip them to do well across a wide range of disciplines. It therefore is not obvious that sex differences in classroom work will be very large. The issue is explored as an empirical matter in Tables 3 and 4.

In Table 3 we present the mean grades earned in the courses of each of the four largest school divisions by students majoring in each division. The grades for men and women are given separately, and two years of typical results (1979-80 and 1980-81) are presented to demonstrate the stability of the data in such analyses. As an example, the table shows that among humanities majors graduating in 1979-80 women earned a mean grade of 3.46 in humanities courses while men earned a mean grade of 3.53. This difference was significant (t-test) at the .05 level. Men in the humanities also did better than women in natural science and engineering courses for that year, but for the 1980-81 graduates there were no significant differences among students in this group.

The findings in Table 3 can be summarized rather simply. There were almost no sex-based differences in grades earned in social science courses, and differences in humanities courses for the two years of data were inconsistent and often of negligible substantive significance even if statistically significant. For courses in these two school divisions, then, women and men performed at the same level. In natural sciences courses, however, men performed better than women in every comparison and nearly all of the differences were quite substantial. Men did better than women in natural science courses no matter what their major. Much the same was true of engineering courses: men performed better than women in almost all

comparisons (the only exceptions, for humanities students, were based on relatively few cases), although fewer of the comparisons were statistically significant. The largest and most consistent differences in engineering courses were for engineering and natural science majors.

In short, men did better than women in natural science and engineering courses, and even among majors in the natural sciences and engineering men did better than women in these areas. Grade point average differences ranged up to 0.27, a substantial difference given that the standard deviation for these comparisons was usually in the range of 0.50 to 0.60. Hence the major sex-related differences in classroom performance lay in technical disciplines, areas that have traditionally been considered "male" domains. In these areas Stanford students generally conformed to sex stereotypes: women did less well in the courses and they were much less likely to major in the departments in these areas.

These results are not encouraging with respect to the goal of equal representation of women in all subject areas at the university. If women do less well in technical areas they will not major in them as often as men do, and it would be unreasonable to expect otherwise. But before accepting these conclusions at face value, we should discuss further analysis of the natural science and engineering courses as presented in Table 4. Here we have analyzed classroom performance by women and men in courses within each department of the natural sciences and engineering. We look at the performance of natural science and engineering majors only because these students accounted for almost all of the relevant enrollments. For the natural science departments we have also distinguished between introductory course sequences and advanced courses. Only the results for the 1979-80 graduates are presented, but analyses for 1980-81 were very similar. Our goal

in this table is to determine whether men's superior performance is limited to certain areas or types of courses or is a general phenomenon found in all courses.

It is very clear from Table 4 that men in the natural sciences and engineering did not do better across the board than their female counterparts. Let us begin with the natural science majors. In biology there was a large difference favoring men in introductory courses (average grades of 3.28 and 3.00) but no difference for advanced courses (3.57 for each sex). In chemistry there was a large difference favoring men in introductory courses but a much smaller and statistically insignificant difference favoring men in advanced courses. In mathematics none of the differences were significant. Only in physics did women do less well than men in both introductory and advanced courses; differences here were most consistent.

These are revealing results: in most natural sciences areas women did nearly as well as men in advanced courses, but they did much less well in introductory courses. This finding implies that women had more trouble at the early stages of their coursework but, once past the hurdles of entering the natural sciences, they did quite well. Physics was something of an exception, however.

For engineering students this rather positive finding did not apply as clearly. We have not distinguished introductory courses from advanced courses in engineering because most of the courses are at a fairly advanced level. In mathematics courses there were no significant differences and women actually did better than men in the advanced courses. But men did better than women in introductory chemistry and physics courses, in advanced chemistry courses, and in chemical engineering. For the other engineering departments there were consistent but small differences favoring men almost across the board. The

only exception was the equal performance of women and men in electrical engineering, but this is especially significant because electrical engineering is considered one of the most rigorous of the engineering disciplines.

In sum, detailed investigation of the natural science and engineering courses shows that the differences between men and women majoring in these areas were smaller for more advanced courses than for introductory courses. The superior performance of men was thus limited and not universal.

This finding should really be treated as preliminary to further investigation into the grading issue. While it is heartening for the university to find that women do well in some technical areas and that women majoring in these areas are especially likely to do well, the more important question that remains to be answered is why women do better in some areas than in others. A related issue is what distinguishes women who do well and major in these areas from women of similar background and ability who do not. Such research is beyond the scope of the Curriculum Study, but analyses such as those given here are indispensable for determining where further research is needed.

SEX DIFFERENCES IN ACADEMIC DIFFICULTY AND AWARDS EARNED AT GRADUATION

In this final section we survey differences between men and women with respect to general measures of academic performance. The first, academic difficulty, indicates whether a student ever was placed on "provisional registration" or "suspension" while at Stanford. These sanctions are imposed on students who do not make satisfactory progress toward a degree. Academic difficulty is thus a negative indicator of academic performance. The other measures are three different awards that can be earned at graduation. Two of these, Phi Beta Kappa and Distinction, are based largely on grades. The third, Departmental Honors, depends on participation in an honors program that involves individual study and research.

Table 5 presents the data for the academic performance measures. The figures for academic difficulty reveal no sex difference at all. About five percent of each sex in each graduating class had academic difficulty, and in no year did the difference between the sexes exceed one percentage point. These figures show quite convincingly that neither sex was especially prone to academic difficulty.

With respect to awards, all three variables modestly favored men. The mean differences were not entirely consistent over the six years for which we have data, but they were reversed (favoring women) for only one year for both Phi Beta Kappa and Departmental Honors. In short, slightly more men than women received honors at graduation. This finding reflects the fact that overall men earned higher grades than women. But none of the differences in these awards were of great enough magnitude to constitute a source of concern.

SUMMARY

We have found that there is considerable conformity to sex stereotypes among Stanford students in the majors they select and their classroom performance. Women come to Stanford with lower mathematics ability than men and they are strongly influenced by their established abilities in their choice of major. Thus women tend to concentrate in the humanistic and social science areas while men favor engineering, the natural sciences, and several traditionally male disciplines in other areas. On the whole women at Stanford are similar to women in the nation as a whole in their degree of conformity to traditional sex differentiation. In addition, women perform less well in natural science and engineering courses. Even women majoring in the technical disciplines do less well in these courses.

These findings are not particularly encouraging from the standpoint of university efforts to ameliorate sex differences. But other findings are more

positive. The proportion of women in engineering and the earth sciences increased rapidly in the late 1970s, with the result that women are far better represented in these areas at Stanford than in the nation as a whole. And, although women do less well in technical courses than men, their poorer performance here is limited mostly to introductory courses and to women who do not major in technical areas. This is especially true for women majoring in the natural sciences, who generally do nearly as well as their male counterparts in natural science courses.

The systematic analyses provided by the Curriculum Study have allowed the university to assess important issues related to sex differences among undergraduates. As the research program proceeds, the results it produces are becoming increasingly important for informing policy-making bodies that have responsibility for undergraduate education. As we have suggested earlier, continuing efforts to combat unreasonable sex differentiation are required if the achievements of the recent decade are not to be lost. The Curriculum Study has an important role to play in these efforts.

In the final article in this series we take up the issue of grading in courses taken by undergraduates. Among the issues we discuss there are the differential grading standards in the various school divisions, the question of grade inflation, and awards earned at graduation.

FOOTNOTES

1. There was only one woman among the eight American studies graduates in the first year the program granted degrees, but by 1979-80 women constituted 72% of graduates and in the next two years they were 64% of graduates.

2. We caution that the "low" group here had scores that were generally very high compared to national averages; the median scores for all students were 610 in the verbal test and 660 in the mathematics test, or about the 95th percentile for the nation [5].

3. The earth science students are combined with engineering because they are so few in number.

4. The median verbal score was identical for men and women, but men had higher mathematics scores (median for men of 690 compared to 630 for women). We performed the same type of analysis as in Table 2 for women split at the men's median mathematics score and reached the same conclusion -- women were more influenced by their SAT scores in selecting majors. The effects were often even more exaggerated in this version of the analysis than where each sex was split on its own median separately.

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TABLE 1

PROPORTION OF WOMEN BY SCHOOL DIVISION,
1975-76 TO 1981-82
(Percentages)

School Division (mean N)	1975 - 76	1976 - 77	1977 - 78	1978 - 79	1979 - 80	1980 - 81	1981 - 82	Mean
Humanities (326)	55	51	54	48	54	50	56	53
Social Sciences (512)	43	41	39	37	40	44	45	41
Natural Sciences (248)	32	25	33	31	29	32	29	30
Interdepartmental (264)	52	55	56	59	58	56	59	56
Engineering (218)	12	13	16	20	21	24	20	18
Earth Sciences (41)	26	25	34	39	43	43	41	36
All Graduates (1609)	42	39	41	40	41	43	44	41

TABLE 2

PROPENSITY OF STUDENTS GROUPED BY SAT SCORES AND SEX
TO MAJOR IN EACH SCHOOL DIVISION
(1979-80 graduates; index numbers[1])

	School Division					
	Engineering[2]	Humanities	Natural Sciences	Social Sciences	Interde-partmental	Mean Deviation[3]
SAT Groups						
High Verbal, High Mathematics Scores[4]						
Women	141	107	142	85	79	25.2
Men	108	101	145	82	72	20.0
Low Verbal, Low Mathematics Scores						
Women	48	98	74	108	121	21.8
Men	79	101	62	117	140	23.4
High Verbal, Low Mathematics Scores						
Women	42	137	8	121	108	43.2
Men	70	150	79	97	124	25.6
Low Verbal, High Mathematics Scores						
Women	168	60	156	92	94	35.6
Men	145	53	108	104	62	28.4
Cases						Total
Women	67	147	69	185	162	630
Men	204	134	167	285	116	906

[1]Index = 100 when students of a given sex and SAT group major in a school division in the same proportion as all students of that sex.

[2]Includes earth science graduates.

[3]Mean deviation of index from 100.

[4]Each sex split separately at the median score on each scale.

TABLE 3

AVERAGE GRADES IN COURSES OF MAJOR SCHOOL DIVISIONS BY SEX
FOR MAJORS IN EACH DIVISION
(1979-80 and 1980-81 graduates)

	Courses in							
	Humanities		Social Sciences		Natural Sciences		Engineering	
Students majoring in:	F	M	F	M	F	M	F	M
Humanities								
1979-80	3.46*	3.53	3.33	3.35	3.04**	3.39	3.29**	3.05
1980-81	3.47	3.48	3.34	3.34	3.16	3.21	3.09	3.09
Cases	5050/5470		1051/1316		1047/948		241/224	
Social sciences								
1979-80	3.41*	3.38	3.32	3.32	3.10**	3.26	3.20	3.27
1980-81	3.39	3.45	3.32**	3.27	3.20	3.23	3.18	3.30
Cases	3340/3341		7063/7056		1707/1683		430/497	
Natural sciences								
1979-80	3.51	3.50	3.51	3.53	3.27**	3.44	3.05*	3.40
1980-81	3.34**	3.45	3.57	3.52	3.26**	3.42	3.36	3.49
Cases	1340/1224		896/948		5706/5102		255/224	
Engineering								
1979-80	3.42	3.38	3.41	3.37	3.09**	3.24	3.13**	3.22
1980-81	3.45**	3.32	3.28	3.39	3.05**	3.29	3.03**	3.30
Cases	877/877		588/687		2791/2780		4947/5454	

*p<.05
**p<.01

TABLE 4

AVERAGE GRADES IN NATURAL SCIENCE AND ENGINEERING COURSES, BY SEX, FOR MAJORS IN THE NATURAL SCIENCES AND ENGINEERING
(1979-80 graduates)

	Students Majoring in:							
	Natural Sciences				Engineering			
Courses in:	Women	N	Men	N	Women	N	Men	N
Biology								
Introductory	3.00**	(288)	3.28	(489)			(Note)	
Advanced	3.57	(180)	3.57	(434)				
Chemistry								
Introductory	3.02**	(231)	3.34	(542)	2.86**	(61)	3.15	(230)
Advanced	3.26	(233)	3.36	(510)	2.72*	(48)	3.01	(172)
Mathematics								
Intro. elementary	3.44	(87)	3.49	(125)			(Note)	
Intro. advanced	3.21	(75)	3.37	(247)	2.99	(138)	3.10	(420)
Advanced	3.32	(29)	3.39	(147)	3.14	(44)	3.02	(196)
Physics								
Intro. elementary	3.08**	(88)	3.41	(171)			(Note)	
Intro. advanced	3.40	(84)	3.53	(239)	3.22**	(156)	3.33	(614)
Advanced	3.23**	(42)	3.49	(344)			(Note)	
Engineering								
Chemical					2.73**	(75)	3.00	(287)
Civil					3.26	(177)	3.33	(459)
Electrical			(Note)		3.33	(148)	3.33	(783)
General					3.09	(274)	3.17	(1045)
Industrial					3.20	(142)	3.31	(500)
Mechanical					3.00	(119)	3.11	(714)

*p<.05 for difference between women and men.
**p<.01 for difference between women and men.

(Note: Too few cases for meaningful analysis.)

TABLE 5

INDICATORS OF ACADEMIC PERFORMANCE
BY SEX, 1976-77 TO 1981-82
(Percentages)

	1976-77		1977-78		1978-79		1979-80		1980-81		1981-82		Means	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Academic Difficulty	5	5	3	2	4	5	5	6	7	6	7	7	5	5
Awards														
University Distinction	24	26	22	24	21	22	16	23	19	25	19	25	20	24
Departmental Honors	12	15	14	12	9	11	10	13	11	11	9	14	11	13
Phi Beta Kappa	9	12	10	11	10	9	8	12	9	9	7	10	9	10
No Awards	68	65	69	69	72	72	75	69	73	69	75	66	72	68
No. Graduates	635	991	668	970	642	957	661	945	681	902	719	931	668	950

FIGURE 1
PROPORTION OF WOMEN GRADUATES BY DEPARTMENT
(mean figures, 1975-76 to 1981-82)

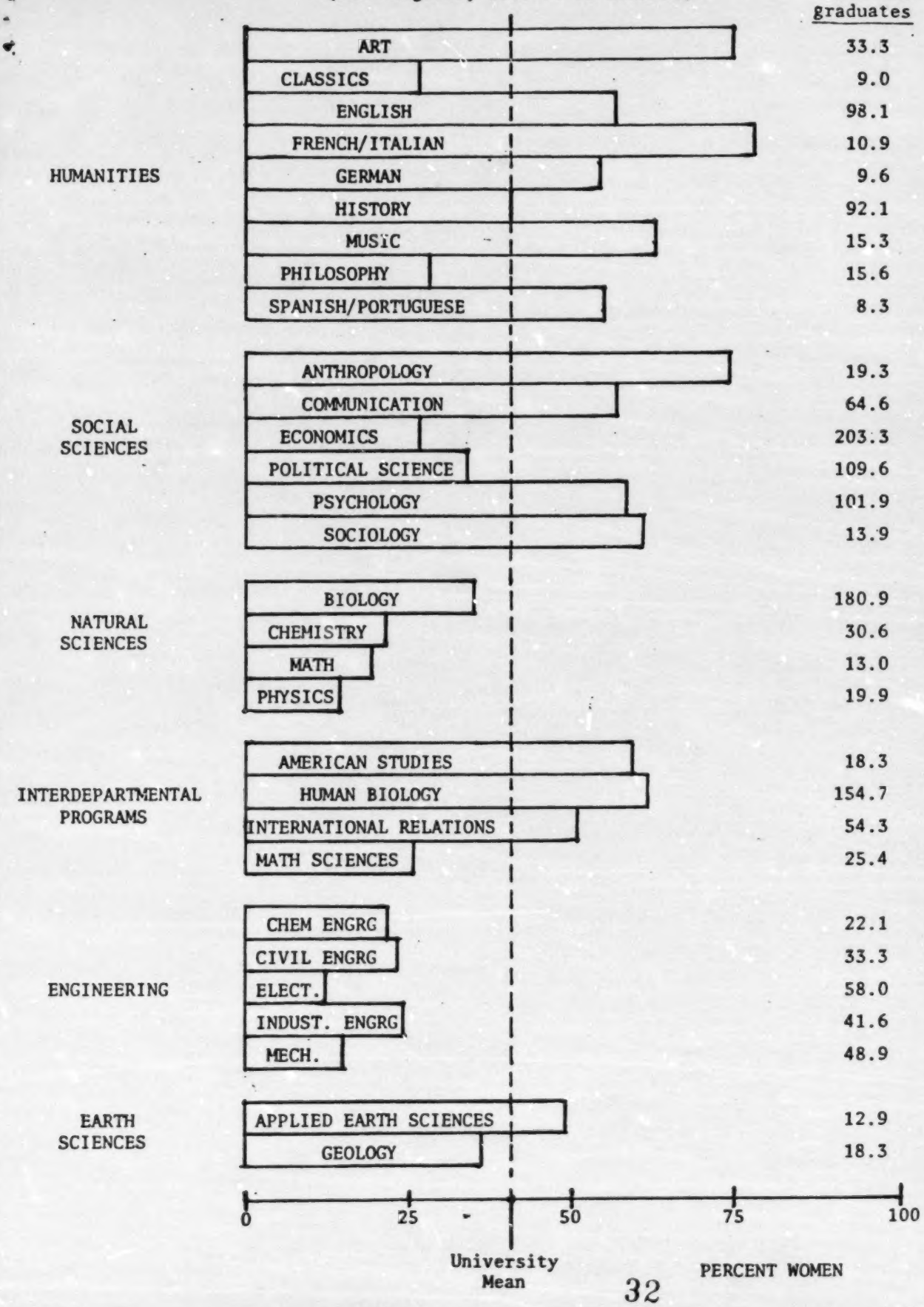


FIGURE 2
PROPORTION OF WOMEN AMONG U.S. AND STANFORD BACHELOR'S DEGREE RECIPIENTS, 1975-76 TO 1979-80, BY DISCIPLINE

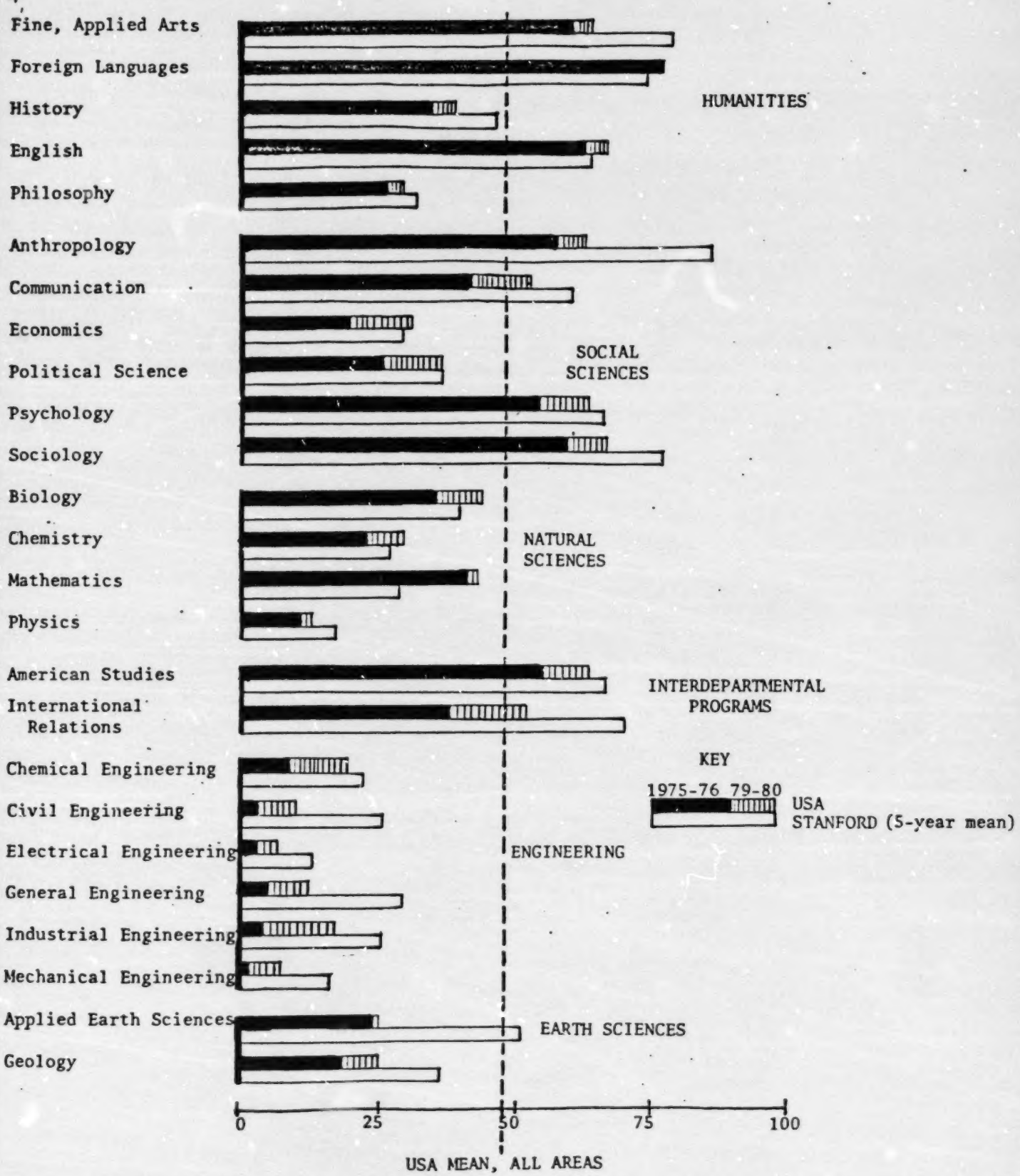
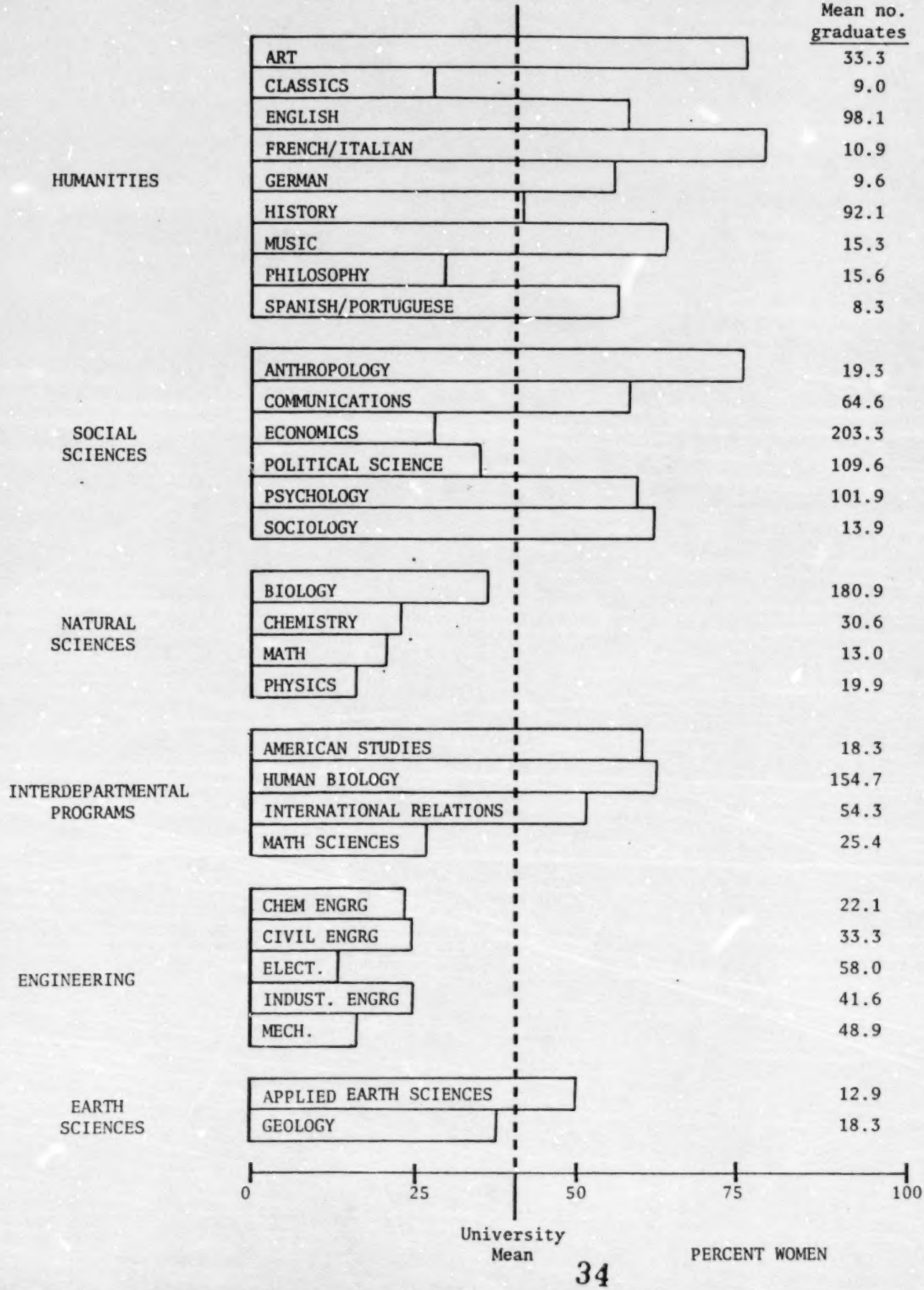


FIGURE 1
PROPORTION OF WOMEN GRADUATES BY DEPARTMENT
(mean figures, 1975-76 to 1981-82)



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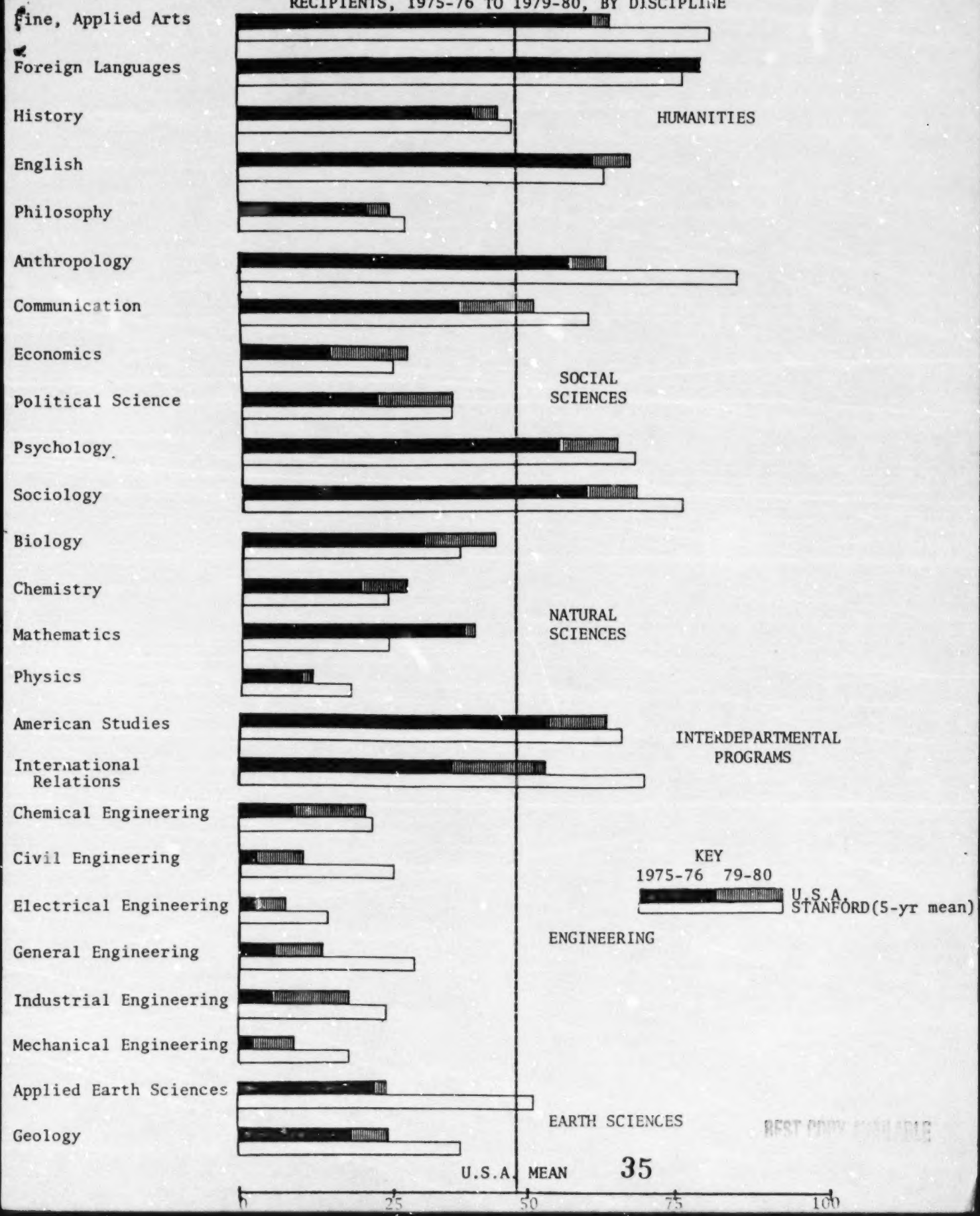

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